

# HUMAN INTESTINAL PROTOZOA IN AMAZONAS

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The following findings of intestinal protozoa in five hundred persons were obtained from faeces collected for helminthic examination. The cases were unselected so far as their state of health was concerned, and were leading more or less normal lives, but almost all were infected with ankylostomes, and some showed malarial parasites in the blood. The majority of the stools were formed, a few were liquid, but no blood was observed in any.

The troops were living in barracks in Manáos, but were drawn from various parts of the State of Amazonas. The children examined were from the schools, and from a girls' orphanage in Manáos, the majority being girls. Matthews and Smith (1918 b) found little difference between boys and girls with regard to *E. histolytica*, *E. coli*, and *L. intestinalis* infections.

## METHODS

The faeces were collected in glass tubes having corks fitted with metal spoons. The tubes were distributed on one day and in the majority of cases collected during the following morning, instructions having been given that the specimen was to be taken on the morning of collection. Some specimens were not ready when due for collection and were collected later. All were examined within forty-eight hours of receipt.

One wet preparation in iodine (iodine 1, potass. iodide 2, water 100) was examined from each stool, but in cases where the diagnosis was in doubt further preparations were made.

One stool only was examined in each case so that only a fraction of the total infections are represented in the results.

The criteria employed in identifying the cysts were those described by Matthews (1918).

## RESULTS

The following protozoal cysts were found:—*Entamoeba histolytica* (Schaudinn), *Entamoeba coli* (Lösch), *Lambli* (*Giardia*) *intestinalis* (Lambl), *Chilomastix* (*Tetramitus*) *mesnili* (Wenyon), *Entamoeba nana* (Wenyon and O'Connor), and *Iodamoeba bütschlii* (Prowazek). *Trichomonas hominis* was not found in any of the five hundred cases, but three infectious were detected in diarrhoeic stools from hospital cases in Manáos.

The total figures are given in Table I.

TABLE I

	Federal Troops		Children of School Age	
	No.	Percentage	No.	Percentage
No. examined ... ..	251	...	249	...
<i>E. histolytica</i> . Above 10 $\mu$ ... ..	45	17.9	35	14.0
Below 10 $\mu$ ... ..	29	11.5	24	9.6
		69*	59†	22.5
<i>E. coli</i> ... ..	97	38.6	92	36.9
<i>L. intestinalis</i> ... ..	21	8.3	35	14.0
<i>C. mesnili</i> ... ..	11	4.4	4	2.8
<i>Blastocystis</i> ... ..	121	48.2	53	36.1
			In 144 cases	In 144 cases

\* 5 cases infected with both large and small cysts.

† 3 cases infected with both large and small cysts.

Figures for *E. nana* were not obtained as the structure of the nuclei of the cysts is not usually visible in iodine, and fixed preparations were not always made where its presence was suspected. It was, however, ascertained to occur.

Mixed infections are shown in Table II.

TABLE II.

	Troops	Children
No. examined ... ..	251	249
<i>E. histolytica</i> + <i>E. coli</i> ... ..	31	21
<i>E. histolytica</i> + <i>E. coli</i> + <i>L. intestinalis</i> ... ..	1	2
<i>E. histolytica</i> + <i>E. coli</i> + <i>C. mesnili</i> ... ..	3	2
<i>E. histolytica</i> + <i>L. intestinalis</i> ... ..	4	6
<i>E. histolytica</i> + <i>C. mesnili</i> ... ..	2	0
<i>E. coli</i> + <i>L. intestinalis</i> ... ..	6	10
<i>E. coli</i> + <i>C. mesnili</i> ... ..	6	2

#### SMALL CYSTS OF *E. HISTOLYTICA*

Small cysts (below  $10\mu$ ) of *E. histolytica* have been noted by James (1914), Woodcock and Penfold (1916), Wenyon and O'Connor (1917), Dobell and Jepps (1917), and others. A detailed account of them, and evidence of their differentiation from the larger cysts of *E. histolytica*, are given by Smith (1918 and 1919).

Most observers hold that these small cysts constitute a separate 'strain' of *E. histolytica*, but Woodcock and Penfold state that it is quite likely that this form is either a distinct species or distinct variety. Morphologically they are similar to the 'ordinary strain' of *E. histolytica*, except only in size, and it has been generally assumed that they belong to the same species. No work appears to have been published on their pathogenicity to animals. Dr. R. M. Gordon and I endeavoured to infect kittens with this small cyst without success, but as failure to infect controls with the large cyst also occurred, no conclusions could be drawn. As some doubt, therefore, exists regarding this so-called 'small strain' the findings of the two sizes have been recorded separately in Table I. In Table IV these figures are combined for comparison with the findings of other observers. Little difficulty was experienced in ascribing infections to their respective groups as very few cysts in the neighbourhood of  $10\mu$  were encountered. In eight cases cysts belonging to both 'strains' were present.

Table III has been compiled from a paper by Smith (1919) with the addition of the present series and shows the relative proportions of 'small' and 'ordinary strains' among the total *E. histolytica* infections. The figures for the two Manáos groups—troops and children—have been added together as the distribution of the two sizes is similar in each group. Attention is drawn by Smith to the small percentage of the 'small strain' in persons who had not been out of England.

TABLE III.  
Size of Cysts in *E. histolytica* Infections.

	England only	England and Abroad				Amazonas
	Matthews and Smith	Mackinnon	Mackinnon (1918)	Dobell and Jepps (1917)	Matthews and Smith	Present Series
	Non-dysenteric cases	Chronic dysenteric cases	Dysenteric and non-dysenteric cases	Dysenteric cases	Dysenteric cases	Troops and Children
Cases ... ..	98	56	209	200	306	125
Infections ... ..	99	59	225	215	325	133
'Ordinary' % ... ..	85	64	47	65	66	60
'Small' % ... ..	15	36	53	35	34	40

Table IV shows the findings of intestinal protozoa by various workers in different parts of the world. The figures represent percentages, and are all based on the results of one examination per case. The figures for *E. histolytica* include all 'strains' above and below  $10\mu$ , excepting those for Queensland where, Dr. Maplestone informs me, no cysts below  $10\mu$  were found. In the latter instance the stools were three to fourteen days old when examined.

Professor Kofoid has kindly supplied me with the figures for the United States of America. He states that they are probably higher than normal in the population as they contain large numbers of foreign immigrants and negroes from Florida. Figures published by Kofoid, Kornhauser and Plate (1919) for overseas troops of the United States Army are somewhat higher than those for home service troops.

TABLE IV

	England			Malta Bentham (1920)	Egypt		Queensland Maplestone (1920)	U.S.A. Kofoid	Amazonas Present Series		
	Mathews and Smith (1918a)		(1919)		Wenyon and O'Connor (1916)	All Ages, 1-80 years				Home Service Troops	Children of School Age
	Children 0-12 years	Hospital Patients Adults and Children	Army Recruits								
No. examined ...	548	450	1098	200	524	87	500	576	251		
<i>E. bistolytica</i> ...	1·8	1·5	5·6	27·5	13·7	11·5	4·6	3·9	27·5		
<i>E. coli</i> ...	11·1	6·7	18·2	27·0*	48·6	20·7	26·4	14·1	38·6		
<i>E. nana</i> ...	2·7	2·4	5·5	5·4*	0·0	0·0	0·0	29·3	+		
<i>I. bütschlii</i> ...	0·2	0·2	0·4	...	14·8	7·0	1·0		+		
<i>L. intestinalis</i> ...	14·1	6·0	7·0	14·8*	0·6	7·0	11·8	6·4	8·3		
<i>G. mestrili</i> ...	1·8	1·5	0·2	25·7*	0·2	1·1	2·2	2·2	2·8†		
<i>T. hominis</i> ...	...	...	...	2·7*	0·0	1·1	...	0·2	0·0		
<i>Blastocystis</i> ...	...	...	...	...	+	+	+	30·7	36·1†		

\* In 74 cases.

† In 144 cases.

## SUMMARY

Five hundred persons living in Manáos were examined for intestinal protozoa with the results tabulated above.

The percentage of *E. histolytica* cysts recorded was somewhat higher than those reported from other countries for which figures are available, excepting Malta.

I am indebted to Dr. H. W. Thomas for allowing me to make use of the material collected for hookworm examination for this investigation.

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